FINAL

First Five-Year Review Report

for

Kalama Specialty Chemicals
Beaufort, Beaufort County, South Carolina

PREPARED BY:

United States Army Corps of Engineers, Charleston District
Charleston, South Carolina

FOR:

United States Environmental Protection Agency
Atlanta, Georgia

April 2003

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Tables

Attachments

List of Acronyms

ARARs	Applicable or Relevant and Appropriate Requirements
AST	Above-ground storage tank
BGS	Below Ground Surface
BRA	Baseline Risk Assessment
BQL	Below Quantitation Limits
CATOX	Catalytic Oxidation
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
ERM	Environmental Resources Management
ESD	Explanation of Significant Difference
FS	Feasibility Study
GETS	Groundwater Extraction and Treatment System
GPM	Gallons Per Minute
GWCC	Ground Water Cleanup Criteria
HASP	Health and Safety Plan
MDL	Method Detection Limit
MCL	Maximum Contaminant Levels
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	Operation and Maintenance
OUs	Operable Units
PLC	Programmable Logic Controller
PRP	Potentially Responsible Party
RA	Remedial Action
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SCDHEC	South Carolina Department of Health and Environmental Control
SCRDI	South Carolina Recycling and Disposal, Inc.
SVE	Soil Vapor Extraction
SVOCs	Semi-Volatile Organic Compounds
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VOCs	Volatile Organic Compounds

Executive Summary

The first five-year review of the Kalama Specialty Chemicals Site in Beaufort, Beaufort County, South Carolina was completed in April 2003. The results of the five-year review indicate the groundwater treatment system, is expected to meet the remediation goals set forth in the Record of Decision (ROD) dated 9/28/1993, and soil removal and replacement remedial actions were functioning as designed, and were operated in an appropriate manner.

Both the Health and Safety Plan and the Contingency Plan are in place, sufficient to control risks, and properly implemented.

Soil

The remedy is protective of human health and the environment. EPA completed the remediation for the soil in June 1995. EPA excavated 604 cubic yards of soil and 80 cubic yards of sediment, eliminating the potential for off-site contaminant migration. The remedy is considered a permanent remedy, and no further action is required.

Groundwater

The remedy properly addresses the remediation goals set forth in the ROD. The groundwater extraction and treatment system is operating and is expected to remove Volatile Organic Compounds (VOCs) as designed. Levels of VOC contaminants are decreasing as needed to achieve cleanup levels within the time frame anticipated at the time of the Record of Decision (ROD), and based on all groundwater contaminated with VOCs upgradient of the wetland area were captured to limit further migration.

Issues:
There are currently no issues that adversely affect the protectiveness of the remedy. However, as expected, during the past five-years, some issues have arisen.

During the second site visit, the contractor (The Beaufort Group) was unable to produce documents supporting the maintenance of on-site equipment. Apparently the contractor organizes these records chronologically, and does not keep separate records for each piece of equipment. Given the inability of the contractor to produce the documents during the site visit indicates a need for changing the current system. The reader is referred to the Recommendations and Follow-up Action section of this report.

During both site visits, several wells were found unlocked. The contractor claimed they were unlocked due to sampling, which occurred the week prior. The reader is referred to the Recommendations and Follow-up Action section of this report.

Capture of the plume is expected based on the groundwater contour maps generated by a computer model. However, according to the Ground Treatment System Performance Verification Plan, water level and chemical measurements are to be taken to verify plume capture. Currently, water level measurements are taken by Shealy Environmental

Services during chemical sampling, but this data has not been used to produce current draw down curves. This draw down data could also be used to optimize the groundwater treatment system. The reader is referred to the Recommendations and Follow-up Action section of this report.

Five-Year Review Summary Form

Site Name: **Kalama Specialty Chemical**		EPA ID: **SCD094995503**
Region: **04**	State: **South Carolina**	City/County: **Beaufort County**
LTRA* (highlight) Y **N**	Construction Completion Date: **10/96**	
Fund/PRP Lead: **PRP**		NPL Status: **Final 09/21/84**
Lead Agency: **EPA Region 4**		
Who conducted the review (EPA Region, state, Federal agencies or contractor): **US Army Corps of Engineers, Charleston District**		
Dates review conducted: **From 3/02 To: 6/02**		Dates of site visit: **6/4/02**
Whether first or successive review: **First Review**		
Circle: Statutory **Policy**		Due Date: **July 2002**
Trigger for this review(name and date): Five years from construction start of OU1 soil remediation.		
Recycling, reuse, redevelopment site (highlight): Y **N**		

Recommendations and Follow-up Actions:

1. Recommend maintenance records be organized by each piece of equipment, and not just chronologically.

2. The Beaufort Group should either require the personnel performing the sampling to lock the wells when sampling is completed or personnel from the Beaufort Group should lock the wells themselves within a day of sampling completion.

3. Draw down curves should be produced periodically to verify plume capture and to aid in the optimization of the groundwater treatment system.

Protectiveness Statement(s):

The remedy is expected to be protective of human health and the environment. The current groundwater treatment system, is expected to meet the remediation goals set forth in the Record of Decision (ROD) dated 9/28/1993, and soil removal and replacement remedial actions were functioning as designed, and were operated in an appropriate manner.

Other Comments:

The current O & M contractor was unable to find monthly reports for May, June, July and October 1998. These documents were apparently lost during the changing of site management. According to the EPA, all required documents have been submitted, and are on file at EPA Region 4 in Atlanta, GA.

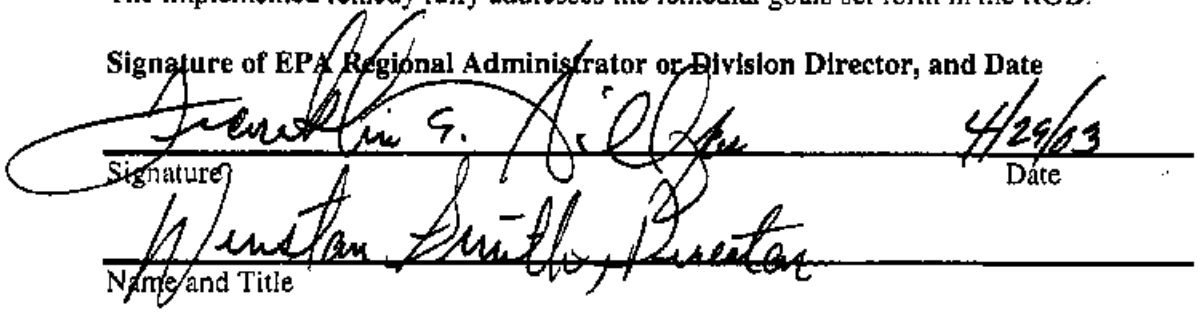
The original infiltration pond was found to have a drainpipe allowing discharge to an area offsite. After the drainpipe was plugged, the water level in the infiltration pond began to rise. The effluent from the treatment system was greater than the infiltration capacity of the pond. This problem was corrected by significantly increasing the size of the infiltration pond.

Initially there were odor complaints from local businesses and/or residences. The issue was resolved by adding an additional air stripper and chemical scrubber.

The initial Remedial Design failed to address the presence of sulphides inside the water treatment facility. As a result, the initial environment inside the building containing the water treatment system was highly corrosive and was reducing the expected lifetime of equipment inside the facility, leading to an increase in the O&M costs. In December 1998, major changes were made to the airflow within the facility to address this problem.

The implemented remedy fully addresses the remedial goals set forth in the ROD.

Signature of EPA Regional Administrator or Division Director, and Date



Signature

4/29/03
Date

Winston Smith, Director
Name and Title

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Kalama Specialty Chemicals
Beaufort County, South Carolina
First Five-Year Review Report

I. Introduction

General. During March 2001 through January 2003, the U.S. Army Corps of Engineers, Charleston District (USACE), on behalf of the U.S. Environmental Protection Agency (EPA), Region 4, conducted a Five-Year Review of the remedy implemented at the Kalama Specialty Chemicals site in Beaufort County, South Carolina. This report documents the results of that review. The purpose of Five-Year Reviews is to determine whether the remedial actions at a site remain protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, any issues identified during the review will be presented, along with recommendations to address them.

Authority. This review is required by statute. Section 121 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and Section 300.430 (f) (4) (ii) of the National Oil and Hazardous Substance Contingency Plan (NCP), require that periodic reviews be conducted at least every five years for sites where hazardous substances, pollutants or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure following the completion of all remedial actions.

This is the first Five-Year Review for the Kalama Specialty Chemicals site. The trigger for this policy review is the passage of five years since the completion of construction and the start of the O&M of the groundwater extraction, treatment and discharge systems.

Local Repository. This review will be placed in the site files and local repository for the Kalama Specialty Chemicals site. The repository is located at Beaufort County Library, 311 Scott St., Beaufort, SC 29902.

Note. Throughout this report, text has been extracted, summarized and/or edited from the following Kalama Specialty Chemicals Site documents; EPA Record of Decision (ROD) dated September 28, 1993, Final Remedial Investigation and Feasibility Report, NPL Site Administrative Index, Operation and Maintenance (O&M) Plan, O&M manuals, monthly reports and quarterly groundwater monitoring data.

II. Site Chronology

The chronology of events for the Kalama Specialty Chemicals Site is given below.

Table 1. Chronology of Site Events.

Event	Date
Site Operations Begin by Vega Chemicals	1973
Vega Chemicals Bought by Kalama Specialty Chemicals, Inc.	1978
Explosion and Fire at Site	January 1979
Initial Discovery by SCDHEC	November 1979
Consent Order by SCDHEC	1980
EPA Proposed Site for Listing on the National Priorities List	September 1983
EPA Designated as Lead Agency for the Site	1986
EPA Entered Into an Administrative Order on Consent with KSCI	January 13, 1988
Begin First Remedial Investigation Activities	July 1989
Completed First Remedial Investigation Field Activities	March 1990
Began Second Series of Site Investigation Activities	September 1991
Completed Additional Site Investigation Activities	October 1991
Submittal of Final RI to EPA	January 1993
Began Public Comment Period for RI/FS	July 1993
Completed Public Comment Period for RI/FS	August 1993
Submittal of the KSCI Remedial Investigation / Feasibility Study (RI/FS) and Record of Decision	September 1993
Pilot Plant Mobilized to Site	July 1995
Biofilter Treating Odors Effectively During PTS, Air Stripper Used on Groundwater From Wells EX-1 and EX-2	September 1995
Pump Test Conducted at Site	January 1996
Soil Removal Conducted at the "Hot Spot"	March 1996
Draft Remedial Design Pulled Back From EPA	August 1996
First Set of Micro wells Installed During Supplemental Pre-Design	October 1996
Ordered STAT 80 and First Caustic Scrubber to Remove Odor	November 1996
Drilling Second Round of Micro wells to Determine Extent of Hotspot	March 1997
New Extraction Wells Drilled, EX-1, EX-2 and EX-3 Abandoned and Grouted	April 1997
Received Discharge Permit from SCDHEC	May 1997
Design Draft Submitted to EPA and SCDHEC	June 1997

Table 1 Cont. Chronology of Site Events.

Construction of Groundwater Remediation System Continued	July 1997
One-Inch Piezometers Installed Around Original Pond. DMS Measured at 300,000 ppb. STAT 180 On-site	August 1997
System Shutdown Due to Odor Complaints. DCA Measured at 40,000 ppb in the Effluent. DMS Testing Shows Elevated Concentrations.	September 16, 1997
New Scrubber Brought to Site	September 1997
System Back On-line	December 1997
System Running Intermittently	April 1998
System Shutdown for Corrosion of Air Strippers	June 1998
System Back On-line	August 1998
System Shutdown for Construction of Pond Expansion.	October 1998
Pond Expansion Complete, System Back On-line	December 1998

III. Background

A. Site Location and Description

Site Operations, Location Descriptions and Land Use.
The site is located on Highway 21, Between a Marine Corps Air Station and a cement plant. The closest home is located less that 100 yards from the site and a day care center is located less than 1/4 mile south of the site. Both the home and the day care center are presently vacant. Some 2500 residents live within a mile of the site. A gas station, cement plant, and drive-in theater are the only abutting properties to the site currently operating. An estimated 40 residences are located within a quarter mile of the site.

The 50-acre Kalama Specialty site is comprised of a former 16-acre manufacturing plant and a 34-acre trailer park located in Beaufort, Beaufort County, South Carolina. Land use in the area is predominantly industrial, as well as a mix of residential, commercial, agricultural, and military. The site is predominantly flat and contains several drainage ditches and concrete slabs.

Soils, Wetlands and Surface Water
The USDA Soil Conservation Service Soil Survey of Beaufort and Jasper Counties, South Carolina (USDA SCS, 1980), identifies three soil map units on the KSCI site. These include Rosedhu fine sand; Ridgeland fine sand; and Wando fine sand, 0 to 6 percent slopes. According to the Soil Survey, approximately half of the site consists of Rosedhu fine sand. Five soil borings were taken adjacent to wetland plant communities on the KSCI site. These borings confirm the presence of hydric soils on the site.

Approximately 30 acres (60 percent of the KSCI site) of wetlands have been identified and delineated using criteria found in the 1987 U.S. Army Corps of Engineers Wetlands

Delineation Manual. These wetlands are comprised of several vegetative community types including Lovegrass – Carex sedge marsh, early successional wet prairie, mixed cypress swamp, hydric pine flatwoods, mixed deciduous – evergreen hydric forest, hydric wax myrtle thicket, and open water ponds.

Incipient rainfall at the KSCI site has been observed to pond in low areas. The site is generally located within the confines of the McCalleys Creek Basin, however no evidence of major stream flow, channelization or sheet runoff is apparent across the entire site. Due to the relative absence of relief across the site, the movement of incoming precipitation is accomplished by direct evaporation, evapotranspiration and infiltration.

Local Hydrogeology

The near surface geology of the study area consists of two aquifers, the water table aquifer and the Floridan Aquifer, separated by clay materials of varying thickness and uniformity. The water table aquifer (or "sand" aquifer) soils consist of sands and clays. Beneath the sand aquifer is a noncontinuous layer of clay or silty clay materials, and beneath this is a confined to semi-confined aquifer of sandy limestone.
The two most conspicuous subsurface hydrogeological structural features in the Low Country and the Site are the Beaufort Arch (a high) and the Ridgeland Trough (a low). They are important because the confining beds overlying the aquifer are thicker in structural basins or troughs, but are thinner over structural highs. The shallow depth to the limestone aquifer over the Beaufort Arch, the low yields of water available from the sand aquifer, and the objectionable water quality found in the sand aquifer have caused the local well drillers and owners to target the limestone aquifer for water supplies, rather than the sand aquifer. This limestone aquifer is the major regional water supply aquifer for the area and is part of the Floridan Aquifer. The subsurface investigation at the Site found these Site-specific lithologies:

- Fine to medium sand from land surface to 15-25 feet;

- Very fine sand occurs beneath to a depth of 60-65 feet, clay content and lenses increase to the bottom of layer;

- Clay and sandy clay, although discontinuous, from 75-85 feet deep; and

- Sandy limestone at 85 feet, the top of Floridan Aquifer.

B. Site Contamination and Study History

Initial Property Usage.

In 1973, the Vega Chemical Company began onsite operations, which included chemical repackaging, custom hydrogenations, and manufacturing the herbicide, Krenite, a du Pont product. Site operations generated wastewater, comprised of cooling water runoff, boiler blow down, and pump seal leakage and spillage, which was disposed of onsite; and other non-aqueous and organic wastes, which were disposed of offsite. Between 1973 and 1975, the wastewater was discharged to a depression in the land, where it then percolated into the ground and contaminated onsite soil and ground water. Between 1976 and 1979,

the wastewater was treated onsite by a land application system, pumped to a holding pond, stabilized in the pond, and discharged to a large tile field. During the 1970s, other releases to onsite soil may have occurred due to onsite incineration of non-chemical solid waste. Kalama Specialty purchased the 16-acre property in 1979 and the inactive trailer park in 1980. Later in 1979, an onsite explosion and fire damaged several reactors and vessels containing chemicals in various stages of manufacture. The estimated 200,000 gallons of water and fire control foam that were used to fight the fire, became contaminated with organics from the ruptured vessels, and migrated from the operations area, forming a pool onsite. This pooled firewater was recovered, and pending offsite disposal, was held in tanks, pools, and tankers. There was an effort to contain some of the material in the wastewater holding pond, but it accidentally seeped into the tile field.

Initial Site Cleanup

During the 1970s, State investigations resulted in the installation of a wastewater treatment system and the initiation of a ground water monitoring program in 1976, and also identified buried drums onsite. Further State investigations, in 1980, identified soil and ground water contamination by VOCs and metals. The State initially ordered Kalama Specialty to cleanup all of the identified contaminated areas. This was later modified and the company was only required to perform studies to determine the extent of the soil and ground water contamination and to design plans for conducting cleanup. In 1980, following abandonment of the original bentonite-lined pond and tile field, Kalama Specialty constructed a larger, plastic-lined lagoon to hold wastewater. Site operations ceased in 1983, and in 1986, Kalama Specialty leased the land to a local contractor for storing and staging of heavy equipment, materials, old oil tanks, construction debris, and concrete. In 1989, the site was abandoned, and the area was fenced.

Initial Remedial Investigation

Due to the presence of contaminants in soils and shallow groundwater, and the potential impact of these contaminants on the Floridan Aquifer, EPA formally proposed the Site for listing on the National Priorities List (NPL) (40 C.F.R. Part 300, Appendix B), on September 8, 1983. The Site was finalized on the NPL by publication in the Federal Register on September 21, 1984, 49 Fed. Reg. 37083, with a Hazard Ranking System (HRS) score of 59.9. EPA and the State agreed that SCDHEC would have lead responsibility for the disposition of the Site. From 1983 to 1986, SCDHEC pursued the necessary studies and remedial activities with KSCI under the SCDHEC Consent Order. Overall, however, KSCI experienced difficulty in meeting schedules and completing work assignments. In an attempt to resolve these difficulties, the State turned the lead for the Site over to EPA's Superfund Enforcement Branch in late 1986.
After reviewing the work done previously by KSCI under the SCDHEC Consent Order, EPA determined that further study was needed to determine the nature and volume of the waste, pathways by which contaminants would move or present the risk of exposure to human health and the environment, and the hydrologic relationship between the upper shallow layer of groundwater and the deeper aquifer. As a result of this determination, EPA on January 13, 1988, entered into an Administrative Order on Consent (AOC) with KSCI to perform a Remedial Investigation/Feasibility Study (RI/FS) at the Site under EPA's oversight. KSCI provided EPA with its final RI report in January 1993.

During the entire RI/FS process (a span of approximately five (5) years), EPA experienced major difficulties in receiving approvable documents from KSCI's contractor Post, Buckley, Schuh and Jernigan, Inc. (PBS&J). PBS&J claimed the existence of a continuous clay confining layer between the soils and deeper aquifer, the existence of which was disputed by both the State and EPA. As a result, each revision submitted during this long period, though somewhat more improved than the previous, remained inadequate due to the characterization of the supposed clay layer.

Final Remedial Investigation and Feasibility Study

On December 14, 1992, EPA sent KSCI a letter informing it that EPA would be taking back the Site, pursuant to the AOC, to complete the RI/FS process due to the failure of KSCI to address comments and concerns of both EPA and the State. Concurrently with the letter, KSCI was informed that, as part of the "Dispute Resolutions" section of the AOC, KSCI would be given the opportunity to submit one final revised set of RI/FS documents for EPA review within the twenty-eight (28) day period set forth in the AOC. If this final set of documents were not approvable, EPA would immediately begin work at the Site. KSCI retained an additional consultant and new counsel in order to address State and EPA concerns. KSCI was able to submit its final revision of the documents on schedule, and has removed or reworded the language regarding a confining clay layer to EPA's and the State's satisfaction.

The primary findings of the remedial investigations can be summarized as follows:

1. Source areas of contamination have been identified in the operations area of the former facility and in the tile field. Chemical runoff and contaminated firewater from the January 1979 explosion and fire, dispersed by surface flow to the areas west and northwest of the operations area, are the sources of one of the contaminant plumes identified at the site. Operation of a wastewater treatment system and tile field is the source of the other plume.

2. Aromatic hydrocarbons, chlorinated hydrocarbons, and inorganic metals have impacted groundwater in the water table aquifer.

3. Aromatic and chlorinated hydrocarbons, semi-volatile organic compounds, and metals have affected soils at the operations area.

4. A contaminant plume extends approximately 700 feet northwest of the tile field; a second plume, which partially overlaps the first plume, extends approximately 550 feet northwest of the operations area (See Attachment D). The calculated rate of groundwater flow is estimated to be 20 feet per year in the middle unit and 28 feet per year in the deeper unit of the water table aquifer. However, the leading edges of the plumes are estimated to be traveling at rates up to 1.5 to 2 times the groundwater flow rate, as indicated by the fate and transport modeling.

5. There is clay and silty clay beneath the water table aquifer across much of the study area. The presence of these materials inhibits but does not entirely prevent the vertical migration of the water table aquifer into the deeper Floridan Aquifer.

Contaminants similar to those in the water table have been detected in the Floridan Aquifer beneath the site.

6. The water table aquifer is designated by the State of South Carolina as Class GB, and therefore is a potential source of drinking water. There is no known use of the water table aquifer within one-quarter mile of the site, although the aquifer is used elsewhere by residents in Beaufort County.

7. Xylene and ethylbenzene were detected in the water table aquifer in September 1991 at one location just west of the KSCI property line, below their MCLs. The western plume was projected to reach the property boundary at the MCL level for benzene in two to six years.

8. The study area is currently zoned for industrial use and lies within an airport noise zone. It has been determined that sixty percent of the study area has been identified as a wetland.

9. The only sources of water to the central ditch are direct precipitation and ground water discharges during periods of elevated water table conditions

Record of Decision

The EPA issued a ROD for the site on September 28, 1993. The major components of the selected remedy include:

Treatment of Soils and sediments contaminated with volatile organic compounds (VOCs) by excavation, volatilization, and solidification (or as a contingency, the removal of contaminated soils from the site);

Replacement of soils into the excavation;

Extraction and treatment of groundwater with additional monitoring wells including new deep wells in the limestone aquifer.

Soil Remediation Established Clean-up Levels.

In accordance with the ROD for KSCI site, the chemical specific soil target clean-up levels are presented in the following table.

Table 2. Soil Clean-up Criteria.

Chemical	Target Clean-up Level (mg/kg)
Toluene	4
Ethylbenzene	7
Xylenes	60
1,1- Dichloroethane	0.023
Benzoic Acid	25,000
Antimony	3
Chromium	40
Lead	500
Nickel	140
Mercury	2

Groundwater Established Clean-up Levels

As found in the ROD for the site, the clean-up criteria for the groundwater are as follows.

Table 3. Groundwater Clean-up Criteria.

Chemical	Target Clean-up Level (ug/l)
Benzene	5
Ethylbenzene	700
Xylenes	10,000
1,2 - Dichloroethane	5
Methylene Chloride	5
1,1 - Dichloroethane	7

Remedial Design Investigation

Foster Wheeler Environmental Corporation conducted pre-design investigations to assess water characteristics and recoverability in the surficial aquifer and groundwater quality in the limestone aquifer. These investigations have included installation of limestone wells, conducting a pilot test to determine influent concentration and operational characteristics, and careful microwell installation to better define optimum extraction well locations.

The pilot test showed that optimum extraction well placement required additional plume characterization. As a result, microwell installation and sampling was performed to more clearly identify the best locations and arrangement of additional extraction wells to capture and contain the plume. In September 1997, the Final Remedial Design and system construction was completed.

IV. Remedial Actions

A. Remedy Selection

The purpose of remedial action at the Kalama Specialty Chemicals Site is to mitigate and minimize contamination in the soils and groundwater, and to reduce potential risks to human health and the environment. The following clean-up objectives were determined based on regulatory requirements and levels of contamination found at the Site:

- To protect the public health and the environment from exposure to contaminated on-site soils through inhalation, direct contact, and erosion of soils into surface waters and wetlands;
- To prevent off-site movement of contaminated groundwater.
- To restore contaminated groundwater to levels protective of human health and the environment.

A complete description of the selected remedy is contained in the ROD. In summary, the Kalama Specialty Chemicals remedy addresses the contaminated soil and the contaminated groundwater present at the Site. The major components of the selected remedy are:

1. Soil

   - Treatment of soils and sediments by excavation, volatilization, and solidification.
   - Replacement of soil into the excavation, grading and seeding to establish a vegetative cover.

2. Groundwater (Pump and Treat)

   - Extraction of groundwater from the sand aquifer.
   - Treatment of groundwater by air stripping to remove organic contaminants and granular activated carbon as a polishing step.
   - Storing treated water onsite in an infiltration gallery, spray field, or surface water.
   - Collecting and storing dewatered solids from the infiltration process onsite pending disposal.
   - Monitoring groundwater onsite.

3. Air

- Treating Air emissions from volatilization as needed to meet ambient air quality standards.

- Monitoring Air onsite.

B. Remedy Implementation

Soil Remedy Implementation
The contaminated soil was removed in June 1995. A total of 604 cubic yards of soil and 80 cubic yards of sediment were removed, eliminating the potential for off-site contaminant migration. This portion of the cleanup was completed in June 1995.

Groundwater Remedy Implementation
An interim pump and treat system has operated since August of 1995 to evaluate operational issues. Design of the full-scale pump and treat system was completed in the spring of 1997 and construction was completed in July 1997. The system has undergone several modifications to make it more effective, including the addition of another air stripper and chemical scrubber to the system in order to lower odors to acceptable levels and enlargement of a discharge pond. The system has been continuously operating since December 1998, initially treating 50 gallons per minute and currently treating 70 gallons per minute of contaminated groundwater. Capture of the plume is expected based on groundwater contour maps generated from a computer model. These maps are shown in attachment F.

C. System Operations

Potentially contaminated groundwater is extracted from eight wells installed at the locations identified on the site plan.

Four-inch diameter Grundfos stainless steel submersible well pumps are installed approximately three feet from the bottom of each well. These pumps extract the water from the recovery wells and discharge it through buried SCH 40 PVC piping to the treatment building.

The influent groundwater to the treatment system is discharged from the PVC piping into a 1,000 gallon HDPE influent equalization (EQ) tank located in the treatment building. This tank permits flow equalization of the influent groundwater. The tank is vented to the outside atmosphere and to the vacuum side of the scrubber.

The water is then pumped to three 6-tray stainless steel low profile air strippers connected in series for processing. The water is pumped from the influent EQ tank to the top of the primary air stripper (a Carbonair Stat 180) and descends across the trays and down into the sump while air is blown across the trays. The water is then pumped from the sump into the top of the second air stripper (a Carbonair Stat 80) where the process is repeated. The water is then pumped from the sump of the second stripper into the top of the third air stripper (a Carbonair Stat 80) where the process is repeated. The treated water from

the third air stripper is pumped into the effluent EQ tank where it is then pumped to the on-site discharge pond.

The exhaust for the three air strippers is discharged to the air scrubber. First, the air scrubber circulates make-up water mixed with a chemical solution of sodium hydroxide and then with a chemical solution of sodium hypochlorite. These chemicals remove the nuisance odor compounds (mercaptans and hydrogen sulfide) from the air stripper exhaust. The blow down from the air scrubber make up water is then discharged to the effluent tank. The treated exhaust air is then discharged into the atmosphere.

The sodium hydroxide storage tank located within the building is vented to the atmosphere.

Environmental Permits

The discharge from the treatment system is governed under the Comprehensive Environmental Response, Correction and Liability Act (CERCLA), which require the substantive requirements of permitting be followed, without necessarily obtaining actual permits. For this site, a land application (No Discharge) permit has been obtained to ensure compliance with the substantive requirements of the South Carolina Department of Health and Environmental Control (SCDHEC). SCDHEC issued permit number ND0076287 on July 10, 1995 and modified on April 30, 1997. The permit was reissued on September 7, 2001 with an effective date of October 1, 2001 and currently expires on September 30, 2008. The permit establishes requirements for water quality discharge and monitoring.

Operation & Maintenance

The groundwater recovery and treatment system installed at the site is capable of operating for extended periods of time without human attention. Built into the system are interlocks and safety devices that will shut down the system to prevent an accidental release and prevent damage to the equipment while operating unattended.

Personnel

As required by the permit, a certified wastewater treatment system operator (physical/chemical grade B) staffs the system and has the ability to perform the needed operational tasks required by the system and is certified in accordance with CFR 1910.120 for hazardous waste personnel. The staff is on call 24 hours per day, 7 days a week to respond to any emergencies.

Site Access

Two locked gates controls access to the treatment building and extraction wells. Only personnel listed on the approved site access list will be allowed entry without being escorted by a Beaufort Group representative. The building is locked when unoccupied. The building will be unlocked and open only when there is a routine inspection, sampling event or ongoing maintenance.

All personnel entering the site are required to report to the office and fill out the site entry log. In addition, personnel performing work on site are required to participate in a brief safety meeting, and review the approved Site Health and Safety Plan.

Inspection Procedures

Inspection procedures have been put in place to insure uninterrupted operation of the groundwater recovery system. As part of this program the following inspections will be conducted.

1. Recovery Well System

- Check piping and valves for visible sign of leakage
- Check pump connections for sign of wear or corrosion
- Check flow rate and pressure
- Check flow meter for proper operation and verify reading is consistent with expected value
- Check pipe supports for stability, wear and corrosion
- Listen to submersible pump for excess noise or vibration
- Open well valve box and check for leakage or corrosion
- Operate all ball valves
- Check for erosion around well structure
- Check structure roof for signs of leakage or corrosion

2. Groundwater Treatment System

- Check tanks for signs of leakage
- Check piping for signs of leakage or corrosion
- Cycle manual valves
- Inspect pumps and blower for excess heat, noise and vibration
- Check operating gauge readings
- Check reading on effluent flow totalizer and record monthly
- Inspect building sump
- Open control panels and inspect wires and connections for signs of wear or corrosion
- Inspect and record level in surfactant, caustic and bleach storage tanks

3. Building and Facility Grounds

- Check underside (insulation) of roof for signs of leakage
- Verify operation of exhaust fan and check for excess heat, noise and vibration
- Verify operation of building louvers and check for signs of wear and corrosion
- Verify operation of unit heaters and check for excess noise and vibration
- Check personnel doors for proper operation and ensure openings are weather-tight
- Check fire extinguishers for proper charge and determine if service is required
- Verify operation of emergency shower and eyewash
- Check discharge outfall for flow during operation
- Check discharge outfall for erosion or scouring

- Check around building for slip, trip and fall hazards

General Cleaning and Housekeeping
The facility should be kept as clean as possible to ensure a safe and efficient work environment. The following tasks will be performed on a monthly basis.

- Complete sweeping of the building interior
- Wipe down computer and control panels
- Wipe down desk, phone and chair
- Clean leaves, etc. from front entry walk and lot.
- Take out trash
- Wipe down equipment, tanks, piping and valves
- Wipe down safety equipment
- Clean windows
- Clean and organize site toolbox
- During growing seasons, mow grass at wells, building and outfall

Storage

General Supplies and equipment

- Flammable or corrosive materials will be stored in contained fence area
- Spare parts will be stored on shelves
- Tools will be stored in tool box on shelves
- Cleaning supplies will be stored on shelves

Chemical Supplies

- Chemical solutions shall be prepared and stored in accordance with manufacturers recommendations and guidelines. Adequate inventory will be stocked on-site. Routine delivery schedules shall be developed with respective vendors to ensure adequate supplies.

Spill Control
Spill mitigation procedures implemented during an incident will conform to and follow the guidelines established in the Spill Prevention Control and Countermeasure Plan.

Maintenance Procedures
It is critical to the success of the remediation system that routine maintenance is performed on equipment installed at the site. As knowledge of the system is gained through extended operation, these procedures should be modified accordingly.

The maintenance tasks will be performed without the system being shut down whenever safe and feasible.

Tanks

The high-density polyethylene (HDPE) tanks installed at the site do not require any maintenance.

Pumps
All pumps should be lubricated weekly. Pump borings rF-sealed do not require lubrication.

Air Stripper Systems
Refer to the manufacturer literature for a detailed list of the required maintenance.

Air Scrubber System
Refer to the manufacturer literature for a detailed list of the required maintenance.

Instrumentation and Controls
Refer to the manufacturer literature for a detailed list of the required maintenance.

Recovery Wells
Over time, then performance of the recovery well can be adversely affected by the following:

- Reduction in well yield
- Plugging of the formation around the well screen by fine particles
- Onset of sand pumping
- Structural collapse of the well casing or screen

Adding a mild acid treatment to the well can correct well failure caused by chemical and biological encrustation. Adding a mild chlorine solution to the well can control well failure caused by iron bacteria. Physically agitating the area around the well screen using a surge plunger or similar method normally corrects well failure caused by physical plugging of the screen or surrounding formation.

Troubleshooting
Refer to the manufacturer literature for guidance on trouble shooting. A troubleshooting guide is included for each piece of equipment installed at the site.

If a piece of equipment continues to malfunction and causes the remediation system to become unreliable, a manufacturer's representative should be contacted for a service call or to obtain a replacement.

O&M Costs

As shown in Table 4, the O&M costs have run significantly higher than the original estimate found in Table 9-1 of the ROD (9/28/1993). While the projected O&M cost were $9,075 monthly ($108,900 annually), the actual costs during the past two-years have average approximately $17,000 per month. It is noted that Table 9-1 in the ROD (9/28/1993) does not appear to take into account the effect of inflation. The projected

annual O&M costs appear to be held constant at $108,900 annually. Table 5 shows the impact on the O&M costs assuming an inflation rate of 5 percent.

Comparing the actual cost to that in Table 5, we find during the past three years, the cost have been about 20 percent higher than projected.

Table 4. O & M Costs for the Kalama Specialty Chemicals Site.

Month	1999	2000	2001	2002
January	$6,196.50	$17,043.75	$22,164.72	$9,684.02
February	$15,009.17	$19,012.63	$12,244.57	$30,389.23
March	$24,875.44	$28,533.28	$26,340.07	$18,405.69
April	$32,205.06	$15,599.00	$18,308.99	$16,439.02
May	$41,899.68	$16,349.92	$12,564.20	$16,355.62
June	$45,930.34	$13,337.36	$10,255.33	$14,445.41
July	$28,791.79	$19,757.17	$21,606.41	$22,437.48
August	$58,892.94	$10,214.26	$16,405.52	$14,045.64
September	$44,751.04	$15,852.31	$15,797.80	$12,097.94
October	$18,104.52	$18,069.75	$19,163.00	$16,027.81
November	$31,929.59	$13,394.44	$18,856.13	$18,859.61
December	$20,855.04	$19,651.05	$8,884.11	$10,618.32
Total	$369,441.11	$206,814.92	$202,590.85	$199,805.79
Monthly Average	$30,786.76	$17,234.58	$16,882.57	$16,650.48

Table 5. Comparison of Projected and Actual O&M Costs.

End of Year	Inflation Factor *	Expected Annual O&M Costs	Expected Monthy O&M Costs	Actual Annual O&M Costs	Actual Monthy O&M Costs
1992	1	$108,900.00	$9,075.00		
1993	1.05	$114,345.00	$9,528.75		
1994	1.10	$120,062.25	$10,005.19		
1995	1.16	$126,065.36	$10,505.45		
1996	1.22	$132,368.63	$11,030.72		
1997	1.28	$138,987.06	$11,582.26		
1998	1.34	$145,936.42	$12,161.37		
1999	1.41	$153,233.24	$12,769.44	369,441.11	$30,786.76
2000	1.48	$160,894.90	$13,407.91	206,814.92	$17,234.58
2001	1.55	$168,939.64	$14,078.30	202,590.85	$16,882.57
2002	1.63	$177,386.62	$14,782.22	199,805.79	$16,650.48
* 5% Rate					

Some reasons for the higher than anticipated cost are as follows. In 1999, some system modifications were made to control odor problems. Year 2000 costs include a field test to determine if in-situ ozone treatment would increase the efficiency of the system. Year 2001 costs and costs for the first half of 2002 are thought to be more representative of expected costs.

C. Progress Since Commissioning

The implemented system has undergone several modifications to make it more effective, including the addition of another air stripper and chemical scrubber to the system in order to lower odors to acceptable levels and enlargement of an oxidation pond. The system has been continuously operating since December 1998, initially treating 50 gallons per minute and currently treating 70 gallons per minute of contaminated groundwater.

V. Five-Year Review Process

The Kalama site Five-year Review was conducted by the U.S. Army Corps of Engineers, Charleston District for USEPA, Region IV. The Remedial Project Manager for the site is Steve Sandler. The following team member(s) from the Corps performed the review:

- Kenneth See, P.E.
- Mitch Hall, P.G.

The Five-year Review consisted of the following activities: a review of relevant documents (**Attachment A**); interviews with EPA Region IV Remedial Project Manager; and two site inspections. The final report will be available in the information repository (Beaufort County Library.)

VI. Five-Year Review Findings

A. Interviews

The following individuals were contacted in person, by fax or phone as part of the five-year review:

EPA Region IV Remedial Project Manager, Mr. Steve Sandler**.**
Mr. Sandler was contacted in 2001 during the initial planning phase for this Five-Year Review. Mr. Sandler provided background information on the Kalama Specialty Chemicals Site and a list of potential contacts having knowledge of site activities. Mr. Sandler has modified the COE January 2003 submission for additional information to add to the review and increase readability of the document.

SCDHEC, Mr. Jim Bowman**.**
Mr. Bowman was contacted by phone to discuss the discrepancy between the selected remedy described in the ROD and the implemented system as well as other concerns SCDHEC may have regarding the site.

The Beaufort Group, Mr. Bob Gross.
Mr. Gross was contacted repeatedly to obtain detailed information regarding the site history, system operation and maintenance, and O&M costs. Mr. Gross was also present during the first site visit.

U.S. Army Corps of Engineers, Regulatory Specialist, Ms. Sandy Frye.
Sandy Frye conducted the ARARs review and was contacted several times for her input regarding ARARs issues.

The Beaufort Group, Mr. Russ Hobbs.
Mr. Hobbs was present during both site visits. Mr. Hobbs answered questions regarding the system operation and maintenance and site history.

Enmark Gas Station, Store Empoyee.
The employee did not wish to provide their name. The employee was contacted in person during the second site visit on November 6, 2002. The employee answered questions regarding site activities and odors complaints.

B. Site Visit and Inspection

The Five-Year Review site inspections for the Kalama Specialty Chemicals Site were held on June 3, and November 6, 2002. Representatives from the U.S. Army Corps of Engineers, and the Beaufort Group took part in the inspections.

An employee at the nearby Enmark gas station was interviewed about any complaints they may have regarding the site such as load noises, heavy traffic or odors coming from the site. The employee had no complaints.

During the site inspections, remedial systems were inspected and groundwater-monitoring efforts were observed. The inspections evaluated the groundwater treatment system, the surface water storage and drainage system, and site fencing.

Both inspections found that several well casings were unlocked. The casings may have been left unlocked from the week prior during groundwater sampling.

The fence appeared to be in good shape and door to the facility was in good working order, indicating the repairs had been completed from the vandalism mentioned in the October 2001 monthly report.

The interior of the facility and much of the equipment inside the facility appeared to be corroded. Hydrogen sulfide and other chemicals contained within the groundwater may be the cause of the corrosion. This corrosive environment has led to shorter than expected equipment life and higher maintenance costs. Changes in the airflow within the building have been made to address this problem.

C. ARAR Compliance Review

An ARAR review was performed for the site in accordance with the draft EPA guidance document, “Comprehensive Five-Year Review Guidance,” EPA 540R-98-0850, October 1999.

Documents reviewed for the ARAR analysis:

- Groundwater Sampling, Report of Analysis, Dated 2/10/1998
- Groundwater Sampling, Report of Analysis, Dated 9/7/1999
- Groundwater Sampling, Report of Analysis, Dated 11/24/1999
- Groundwater Sampling, Report of Analysis, Dated 7/10/2000
- Groundwater Sampling, Report of Analysis, Dated 11/8/2000
- Groundwater Sampling, Report of Analysis, Dated 3/6/2001
- Groundwater Sampling, Report of Analysis, Dated 7/12/2001
- Groundwater Sampling, Report of Analysis, Dated 3/11/2002
- Various Effluent Sampling Results
- Record of Decision, Dated 9/28/1993

As the remedial action goals for source control and soil cleanup have presumably been met, this review only evaluates those ARARs identified in the 1993 ROD for the groundwater remediation portion of the remedy. A discussion of the compliance status groundwater ARAR compliance is found in the following table:

Table 6. Changes in Standards and ARAR Compliance Review.

ARAR	Type[1]	Requirement	Compliance Status
40 CFR 261, 262, 263 & 268	A	Regulations governing the management and disposal of hazardous wastes.	Any waste generated during the water treatment process (sludges, filters, etc.) must be classified as hazardous or non-hazardous. Hazardous wastes must be properly managed and disposed of.
SC HWMR 61-79.124, 79.261, 79.262, 79.263 and 79.268	A	Regulations governing the management and disposal of hazardous wastes	Any waste generated during the water treatment process must be classified as hazardous or non-hazardous. Hazardous wastes must be properly managed and disposed of. .
49 CFR 107, 171-179	A	Regulates the labeling, packaging, placarding, marking and other requirements for shipment of hazardous materials ofF-site.	Any wastes generated on-site, if also deemed to be DOT hazardous materials, must be done so in accordance with these regulations.
40 CFR 60 and 61	A	Regulations for emissions of hazardous air pollutants.	While identified as an ARAR in the ROD, there are no applicable or relevant and appropriate sections of the NESHAPs that apply to current activities at the site.
SC Reg. 61-62	A	State air quality regulations pertaining to emissions of hazardous and criteria air pollutants.	Emissions from the water treatment system are not likely to trigger any SC air quality control requirements. March 2002 influent data indicates volatile contaminants to be at low enough levels that regulatory allowable emissions of air toxics [SC Reg. 61-62.5, Standard #8] are not likely to be exceeded.
		Clean Water Act	As the treatment discharge pond does

40 CFR 122, 125, 133, and 136	A	requirements regulating point source discharges to Waters of the U.S.	not meet the definition of Waters of the U.S., these regulations do not apply to the groundwater treatment system.
40 CFR 403.5	A	Clean Water Act pretreatment standards for discharges to POTWs	As the current system does not discharge treated water to a POTW, these standards do not apply.

Table 6 Cont. Changes in Standards and ARAR Compliance Review.

SC Reg. 61-68	A	SC Water Classifications and Standards. Establishes numerical standards for protection of State Waters.	While the treatment pond may not meet the definition of state waters, it does function as an infiltration gallery to groundwater and therefore, the standards apply for protection of groundwater. Recent effluent data indicates that contaminant levels are below regulatory thresholds for organic contaminants. However, effluent data for metals was not available, so only an evaluation of organic contaminants could be done.
SC Reg. 61-71	A	SC Well Standards and Regulations pertaining to well construction, location and abandonment for remedial work at hazardous waste sites.	Current information indicates all wells are in compliance.
40 CFR 131	R/A	Ambient Water Quality Criteria – provides numerical standards for surface water quality	As no discharge is being made to surface waters (or Waters of the US), these standards do not apply to the current remedy.
40 CFR 141-143	R/A	SDWA established national primary and secondary drinking water standards. Included are MCLs and MCLGs.	Cleanup goals are based both on the Federal MCL values as well as State MCLs.
SC Reg. 61-58	R/A	SC Primary Drinking Water regulation. Similar to Federal SDWA MCLs listed above, only states have the option to establish more stringent levels.	Cleanup goals are based both on the Federal and State MCL values. If the state has a more stringent value than the Federal regulations, the State value will be the ARAR.

1 – A – applicable, R/A – relevant and appropriate.

The following table lists chemicals of concern identified in the 1993 ROD for which cleanup goals were developed. Changes in the standards [Federal and State MCLs] used to establish the cleanup goals are noted in the table as well.

Table 7. Chemicals of Concern and Associated Cleanup Level.

Contaminant[1]	Media[2]	Cleanup Level[3]	Standard[4]	
Benzene	GW	5	Previous	5
			New	5
1,2-Dichloroethane	GW	5	Previous	5
			New	5
Ethylbenzene	GW	700	Previous	700
			New	700
Methylene Chloride	GW	5	Previous	5[5]
			New	5
Toluene	GW	None	Previous	1000
			New	1000
Vinyl Chloride	GW	None	Previous	2
			New	2
Xylenes (o,m &p)	GW	10,000	Previous	10,000
			New	10,000
1,1-Dichloroethene	GW	7	Previous	7
			New	7
Antimony	GW	None	Previous	---
			New	6
Chromium	GW	None	Previous	---
			New	100
Lead	GW	None	Previous	---
			New	15[6]

Table 7 cont. Chemicals of Concern and Associated Cleanup Level.

Mercury	GW	None	Previous	---
			New	2

1 –Only the principal COCs identified the ROD or those with standards promulgated since the ROD are listed here. Table 7-2 of the ROD was used to generate this list of COCs for the 5-year review process.
2 – S = soil, GW = groundwater, SW = surface water, SED = sediment and A=air.
3 – all units for groundwater cleanup levels are in ug/L (ppb). Cleanup levels for groundwater are those listed in the September 1993 ROD.
4 – The standard listed is the Federal MCL. State MCLs are currently the same as Federal MCLs for the contaminants listed.
5 – Value listed as proposed MCL in the ROD. The MCL for methylene chloride has since been finalized.
6 – The value listed for lead is not an MCL, but rather a treatment technique as listed is 40 CFR 141.80.

D. Data Review

As can be seen in Table 8, the chemical concentration of Benzene, 1,2 DCA and Methylene Chloride remain above the Maximum Concentration Level (MCL) in at least one sampled well, however a review of records and monitoring reports through March 2002 indicates that since the initiation of groundwater extraction, the major organic contaminants concentrations have decreased with natural variations in concentrations. This is shown graphically in Attachment E.

Table 8. Organic Chemical Concentration Comparisons with MCL's.

		March-02	March-02	March-02
* ND - Not Detected		Groundwater	Groundwater	Groundwater
	Groundwater	Concentration	Concentration	Concentration
	MCL	Well EX-04	Well EX-05	Well EX-09
Chemical	(ug/l)	(ug/l)	(ug/l)	(ug/l)
Benzene	5	12	53	170
1,2-DCA	5	350	330	350
1,1-DCE	7	ND*	ND*	ND*
Ethylbenzene	700	ND*	ND*	590
Methylene Chloride	5	ND*	ND*	14
Xylenes	10000	ND*	5.1	1700

VII. Assessment

The following conclusions support the determination that the remedy implemented at the Kalama Specialty Chemicals site is expected to be protective of human health and the environment upon completion.

Question A: Is the remedy functioning as intended by the decision documents?

- **Record of Decision:** The selected remedy fully addresses the remedial goals found in the ROD.

- **HASP/Contingency Plan:** Both the HASP and the Contingency Plan are in place, sufficient to control risks, and properly implemented.

- **Implementation of Institutional Controls and Other Measures:** Institutional controls are in place and no current or planned changes in land use at the site suggest that they are not effective.

- **Remedial Action Performance:** The soil and sediment excavation has been effective in removing contaminants form the site. The groundwater treatment system appears to be reducing the levels of volatile organic compounds to levels specified in the remedy.

- **System Operations/O&M:** The implemented system has operated 85% of the available time.

- **Cost of System Operations/ O&M:** The costs appear to be about 20 percent higher than projected (including the effect of inflation). The higher O&M costs may be the result of the corrosive environment initially found within the treatment facility and various system modifications.

- **Opportunities for Optimization:** Draw down curves should be produced periodically to verify plume capture and to aid in the optimization of the groundwater treatment system.

- **Early Indicators of Potential Remedy Failure:** No early indicators of Potential Remedy Failure were found.

Question B: Are the assumptions used at the time of remedy selection still valid?

- **Changes in Standards and To Be Considered:** This five-year review did not identify changes in Standards and To Be Considered.

- **Changes in Exposure Pathways:** No changes in the site conditions that affect exposure were identified as part of the five-year review. There are no current or planned changes in land use. No new contaminants, sources, or routes of exposure were identified as part of this five-year review. There is no indication that hydrologic/hydrogeologic conditions are not adequately characterized.

- **Changes in Toxicity and Other Containment Characteristics:** Organic contaminant levels have decreased since the implementation of the remedy. Inorganic contaminate (metals) levels are not sampled, therefore it is not known if they have changed.

- **Changes in Risk Assessment Methodologies:** Changes in risk assessment methodologies since the time of the ROD do not call into question the protectiveness of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

- No additional information has been identified that would call into question the protectiveness of the remedy.

VIII. Issues

There are currently no issues that adversely affect the protectiveness of the remedy. However, as expected, during the past five-years, several issues have arisen.

- During the second site visit the second site visit, the contractor (The Beaufort Group) was unable to produce documents supporting the maintenance of on-site equipment. Apparently the contractor organizes these records chronologically, and does not keep separate records for each piece of equipment. Given the inability of the contractor to produce the documents during the site visit indicates a need for changing the current system. The reader is referred to the Recommendations and Follow-up Action section of this report.

- During both site visits, several wells were found unlocked. The contractor claimed they were unlocked due to sampling, which occurred the week prior. The reader is referred to the Recommendations and Follow-up Action section of this report.

- Capture of the plume is expected based on the groundwater contour maps generated by a computer model. However, according to the Ground Treatment System Performance Verification Plan, water level and chemical measurements are to be taken to verify plume capture. Currently, water level measurements are

taken by Shealy Environmental Services during chemical sampling, but this data has not been used to produce current draw down curves. This draw down data could also be used to optimize the groundwater treatment system. The reader is referred to the Recommendations and Follow-up Action section of this report.

IX. Recommendations and Follow-up Actions

1. Recommend maintenance records be organized by each piece of equipment, and not just chronologically.

2. The Beaufort Group should either require the personnel performing the sampling to lock the wells when sampling is completed or personnel from the Beaufort Group should lock the wells themselves within a day of sampling completion.

3. Draw down curves should be produced periodically to verify plume capture and to aid in the optimization of the groundwater treatment system.

X. Protectiveness Statement

Based on this Five-Year Review and the above summary, the following conclusion is drawn:

Elements of the remedy regarding the remediation of the soil and air, for the Kalama Specialty Chemical site have been put in place, are functioning properly, and remain protective of human health and the environment. The element regarding the remediation of the groundwater designed to attain the remedial goals listed in the ROD has been put in place, is functioning properly and remains protective of human health and the environment.

XI. Next Review

The Kalama Site is a policy site that requires on-going five-year reviews. USEPA should conduct the next review within five years of completion of this first five-year review listed as the date of signature on the inside cover of this report.

ATTACHMENT A

Documents Reviewed

ATTACHMENT A

Documents Reviewed

Record of Decision. Kalama Specialty Chemicals, Beaufort, South Carolina, (EPA, September 23, 1993).

Feasibility Study Report, PBS&J, January 1993.

Operation and Maintenance Plan by The Beaufort Group, March 1999.

Site Health and Safety Plan by The Beaufort Group, April 1999.

Spill Prevention Control and Countermeasure Plan, Foster Wheeler Environmental Corporation.

Engineering Report Pilot Groundwater Treatment System, Foster Wheeler Environmental Corporation.

Addendum #1, Pilot Groundwater Treatment System, Foster Wheeler Environmental Corporation.

Field Sampling and Analysis Plan, Foster Wheeler Environmental Corporation.
Monthly Reports Dated From Dec 1998 to April 2002.

Remedial Action Report, Foster Wheeler Environmental Corporation.

Action Memoranda.

Groundwater Treatment System Performance Verification Plan, Foster Wheeler Environmental Corporation.

S. C. Construction Permit for Wastewater Treatment System. (No. 18146-IW).
South Carolina Land Application Permit No. ND0076287, Expires Sept. 30, 2008.

Fact Sheets.

Community Relations Plan.

On-Site Daily Logs (Reviewed During Site Visit).

Material Safety Data Sheets for All Chemicals.

ATTACHMENT B
Site Visit and Contact Information

ATTACHMENT B
Site Visit and Contact Information

5-Year Review Site Visit
Date: 4 June 2002
Location: Kalama site
Beaufort, SC

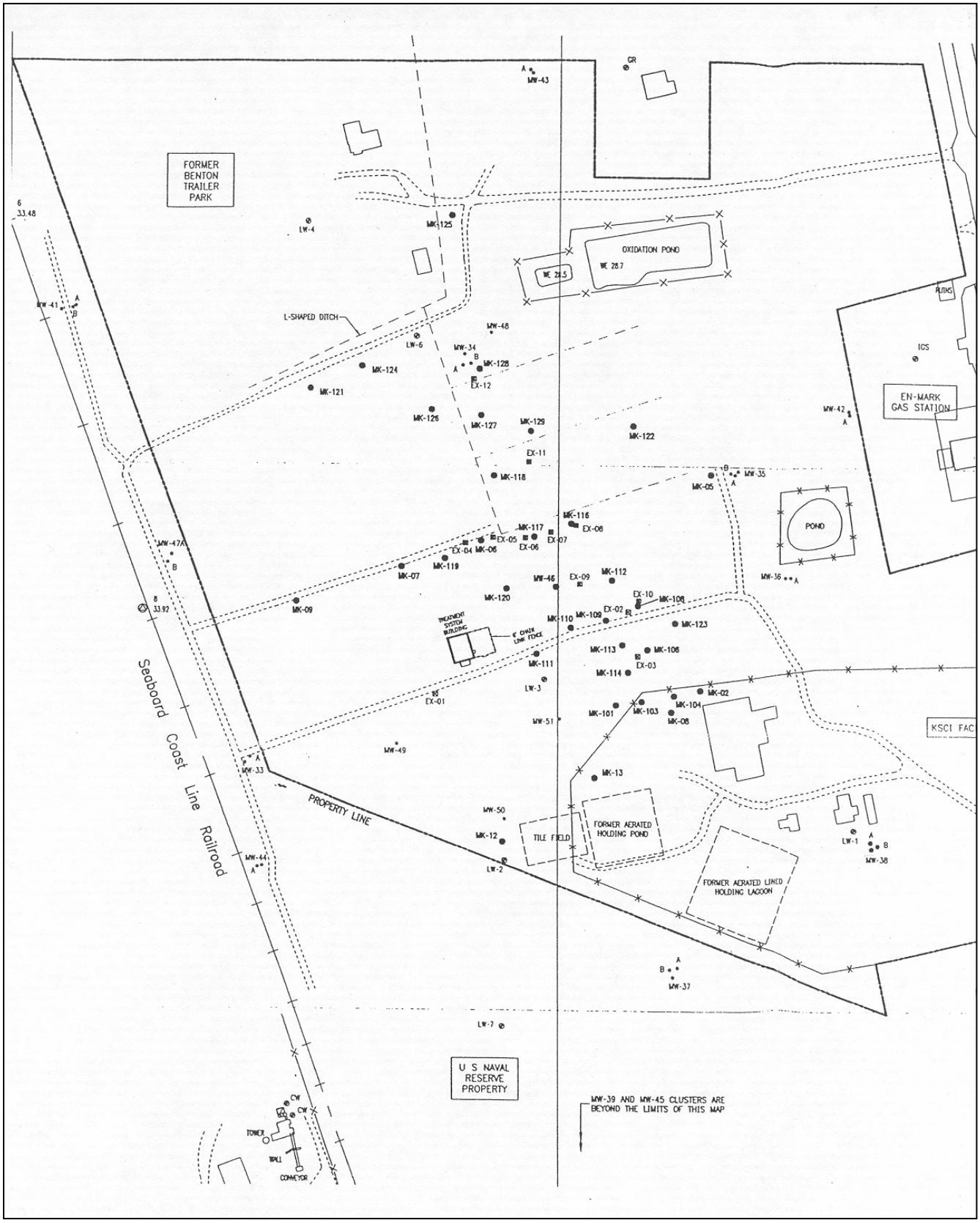
ATTENDEES				
Name/Title	Organization	Address	Phone	Fax
Mitch Hall, P.G.	USACE, Charleston	69-A Hagood Ave Charleston SC 29403	843-329-8155	843-329-2330
Dante Agulto	USACE, TAC	P.O. Box 2250 Winchester, VA 22604	540-665-3990	540-665-3628
Bob Gross	The Beaufort Group	P.O. Box 70042 Lady's Island, SC 29907-0001	843-982-0606	843-982-0707
Russ Hobbs	The Beaufort Group	P.O. Box 70042 Lady's Island, SC 29907-0001	843-982-0606	843-982-0707

5-Year Review Site Visit
Date: 6 November 2002
Location: Kalama site
Beaufort, SC

ATTENDEES				
Name/Title	Organization	Address	Phone	Fax
Mitch Hall, P.G.	USACE, Charleston	69-A Hagood Ave Charleston SC 29403	843-329-8155	843-329-2330
Kenneth See, P.E.	USACE, Charleston	69-A Hagood Ave Charleston SC 29403	843-329-8059	843-329-2330
Russ Hobbs	The Beaufort Group	P.O. Box 70042 Lady's Island, SC 29907-0001	843-982-0606	843-982-0707

Attachment C

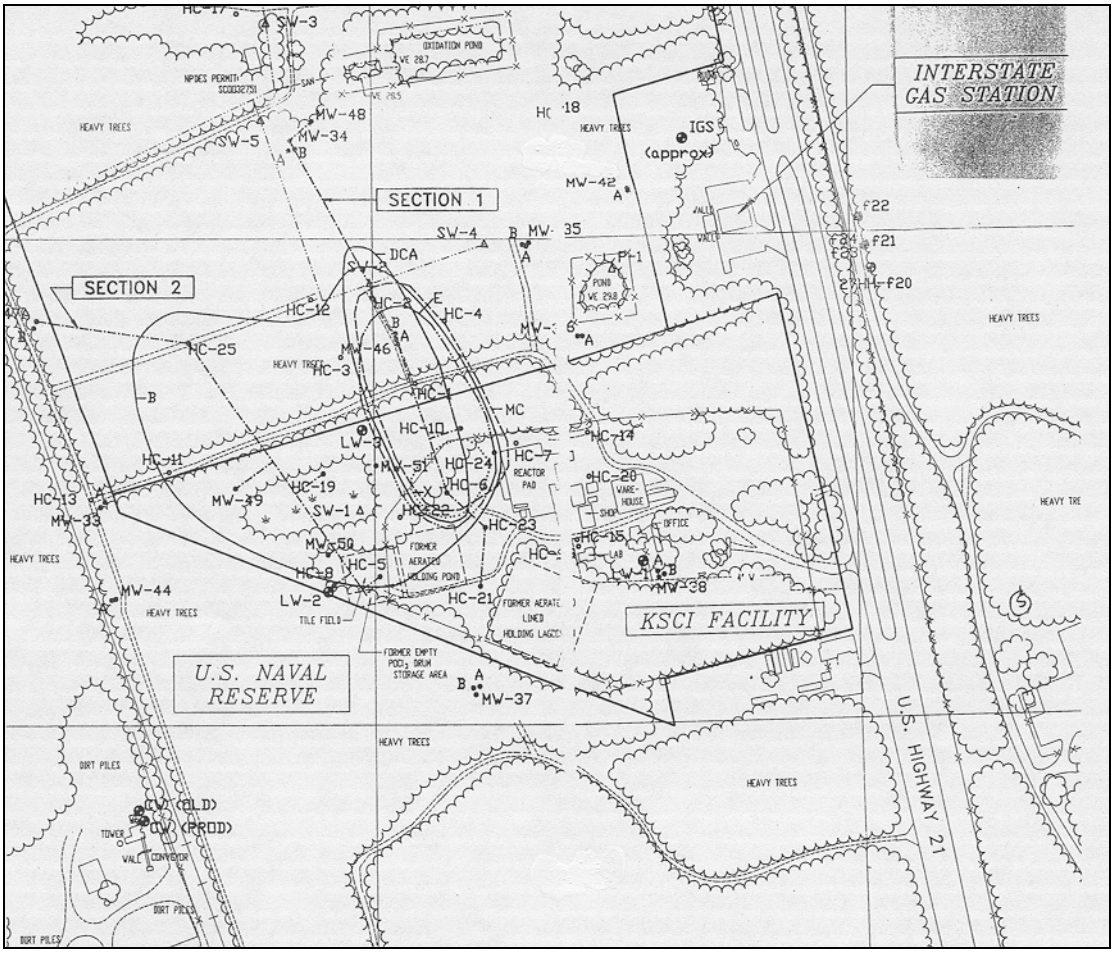
Kalama Site Map



Site Map of Kalama Specialty Chemicals.

Attachment D

Map of Plume Locations



Map Showing Location of Plumes as of December 13, 1991.

Attachment E

Site Photographs

Figure E-1. Sign at Entrance to Facility.

Figure E-2. Air Scrubber Towers.

Figure E-3. Treatment System Building.

Figure E-4. PH Probe (Used for Odor Control).

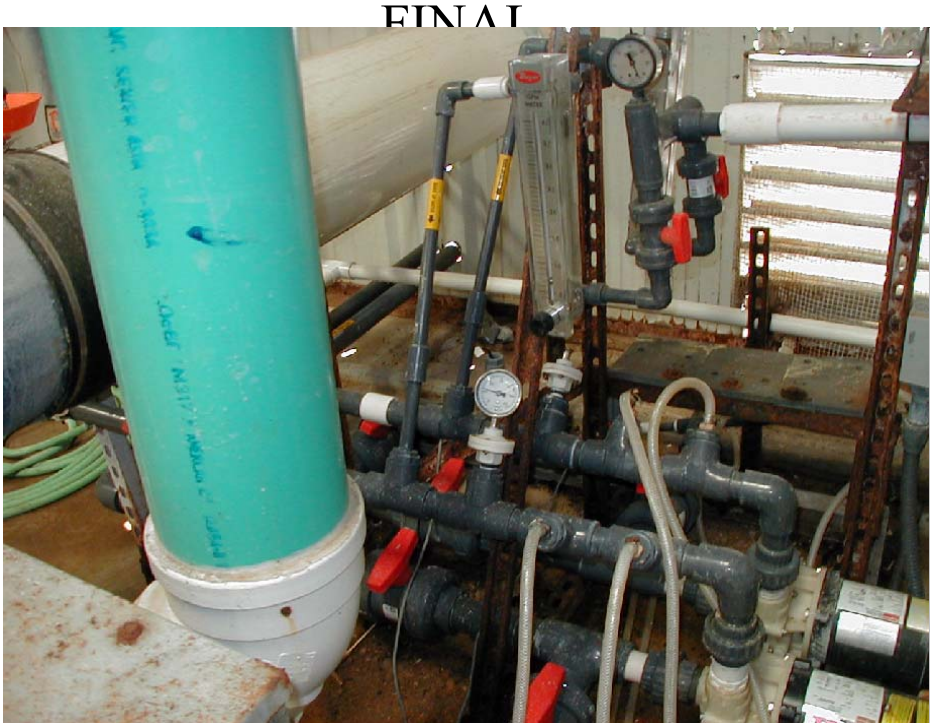


Figure E-5. Pumps for Makeup Water.

Figure E-6. Caustic Soda Storage Tank (On Right in Photograph).

Figure E-7. Air Stripper No. 1 & 2 and Transfer Pump.

Figure E-8. Air Stripper No. 2 & 3 and Effluent Equalization Tank.

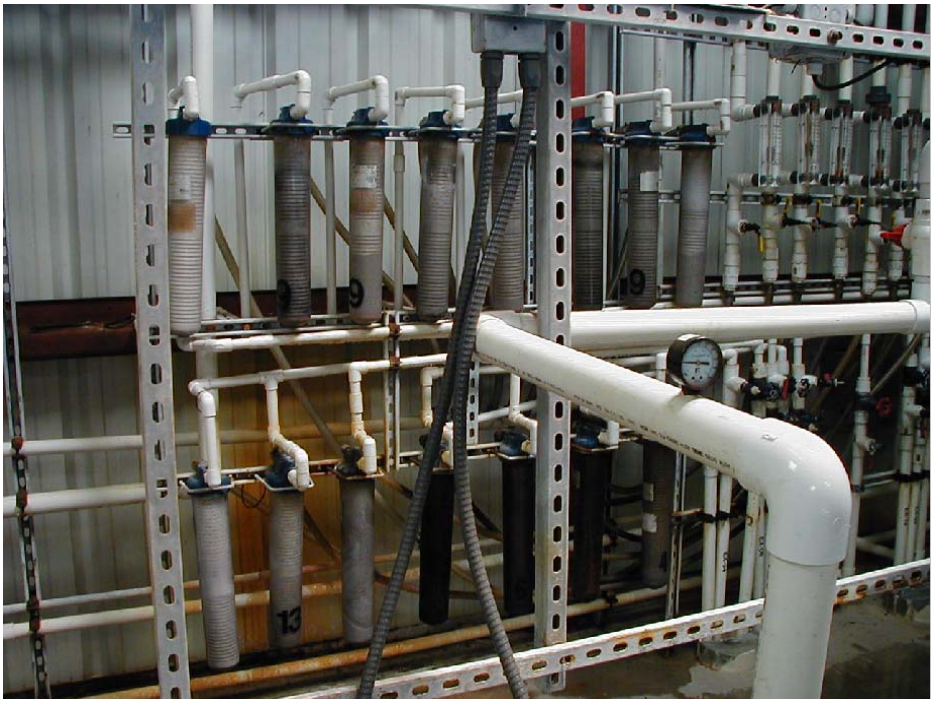


Figure E-9. Sediment Filtration System and Flow Gages.

Figure E-10. Influent Equalization Tank.

Figure E-11. Effluent Equalization Tank.

Figure E-12. Surfactant Storage Tanks.

Figure E-13. New Air Diffuser.

Figure E-14. Protective Casing for Extraction Well EX-05

Figure E-15. Protective Casing for Extraction Well EX-09 (Upper Left in Photograph).

Figure E-16. Oxidation Pond.

Attachment F

Sampling Data Results

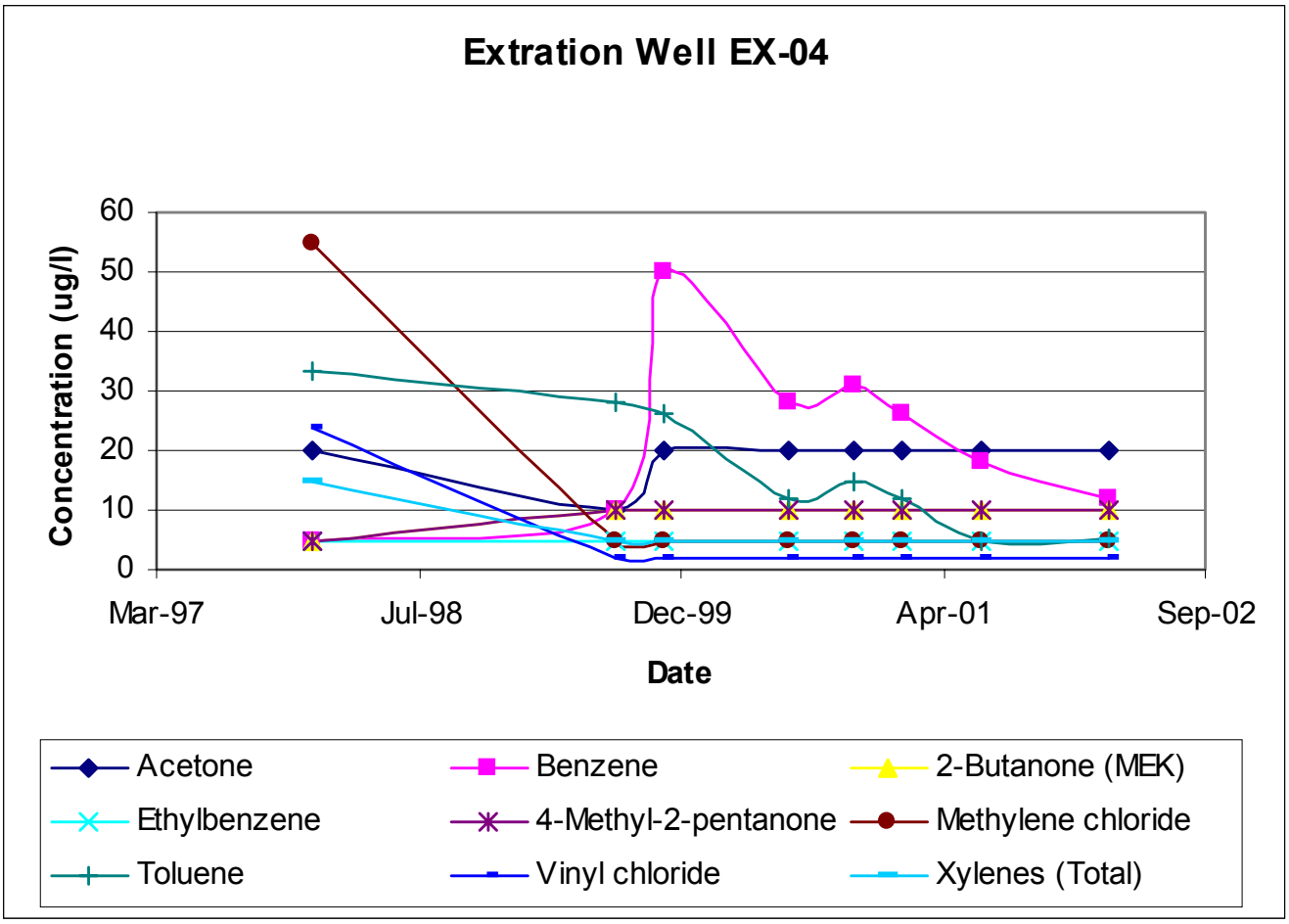


Figure F-1. Organic Chemical Concentrations Measured at Well EX-04.

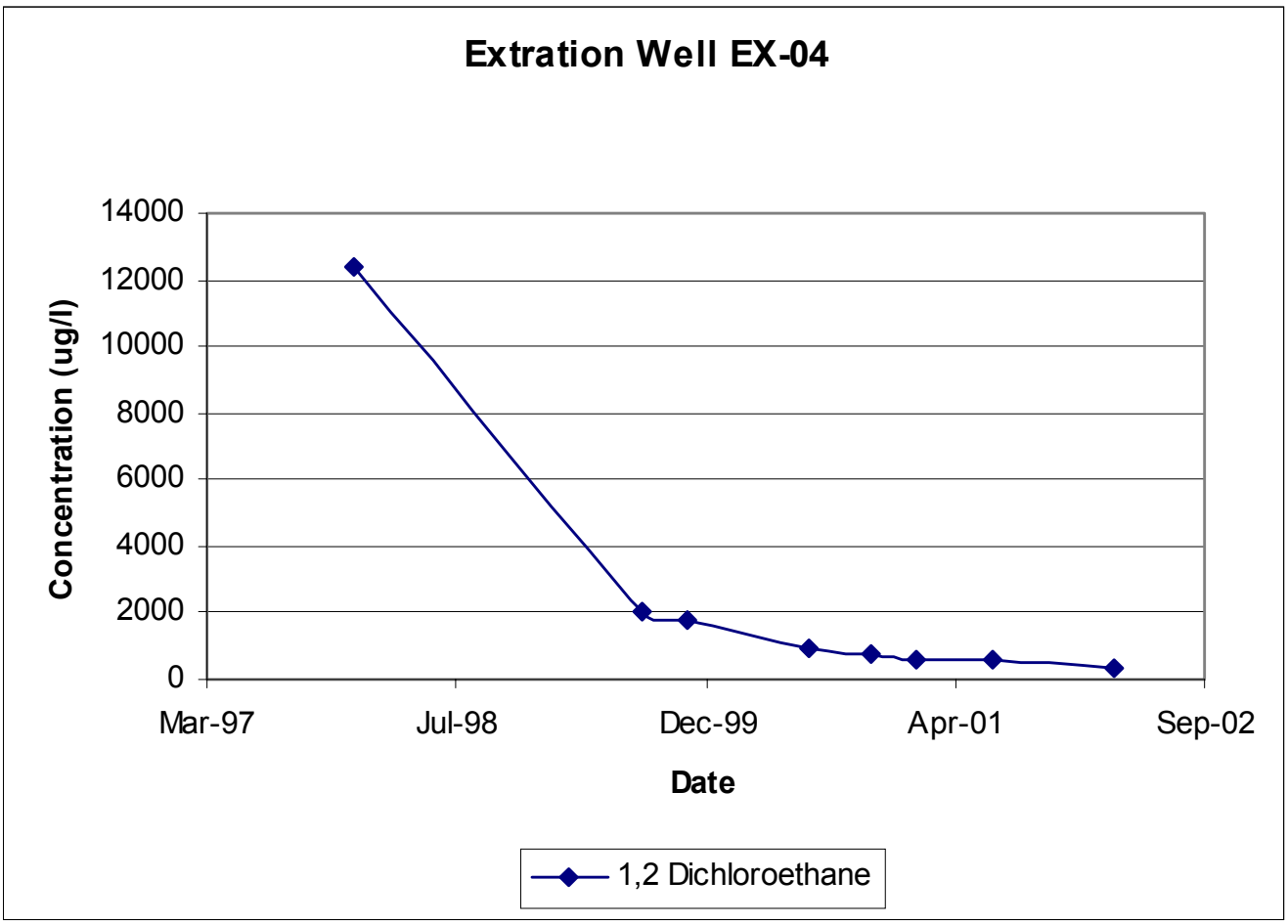


Figure F-2. Concentration of 1,2 Dichloroethane Measured at Well EX-04.

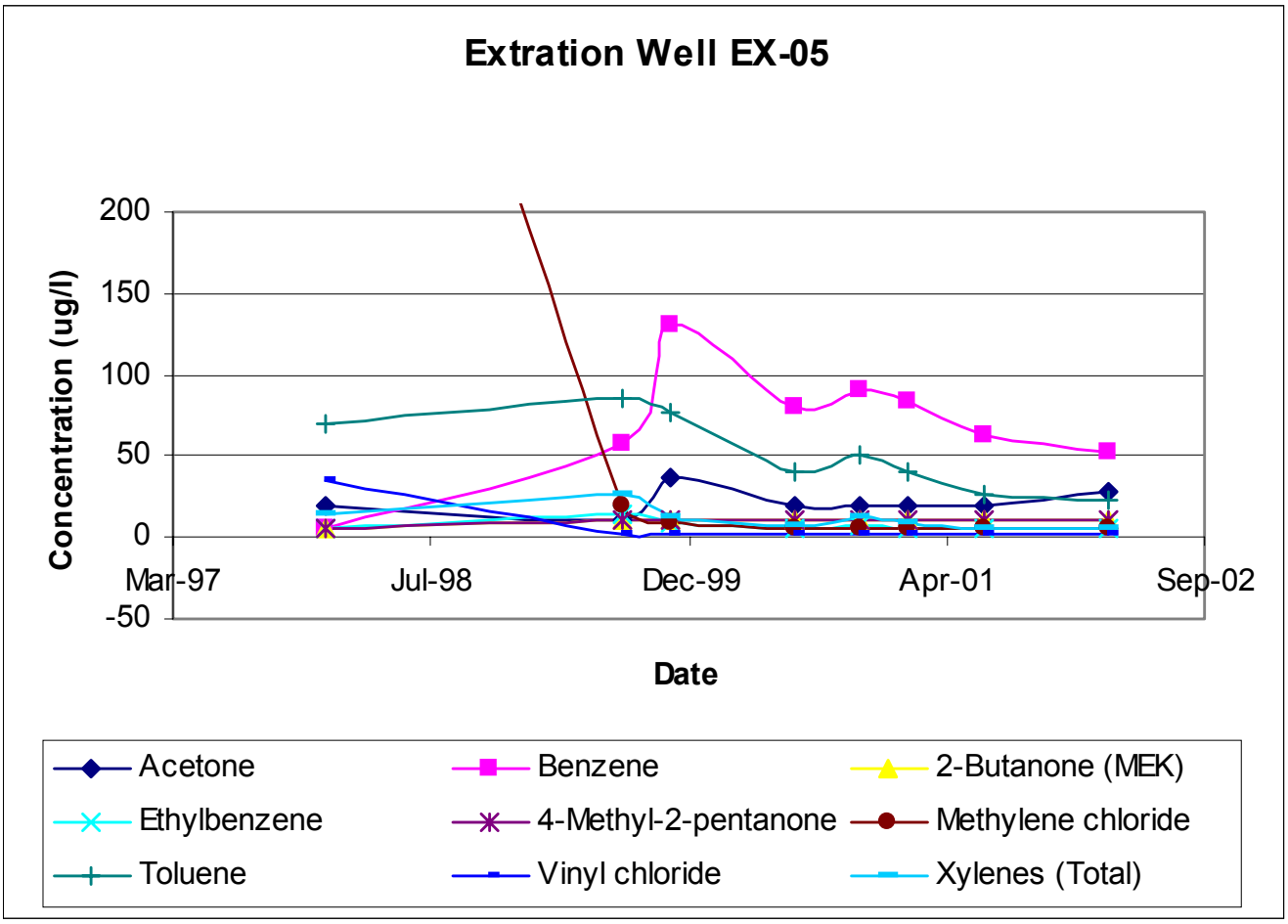


Figure F-3. Organic Chemical Concentrations Measured at Well EX-05.

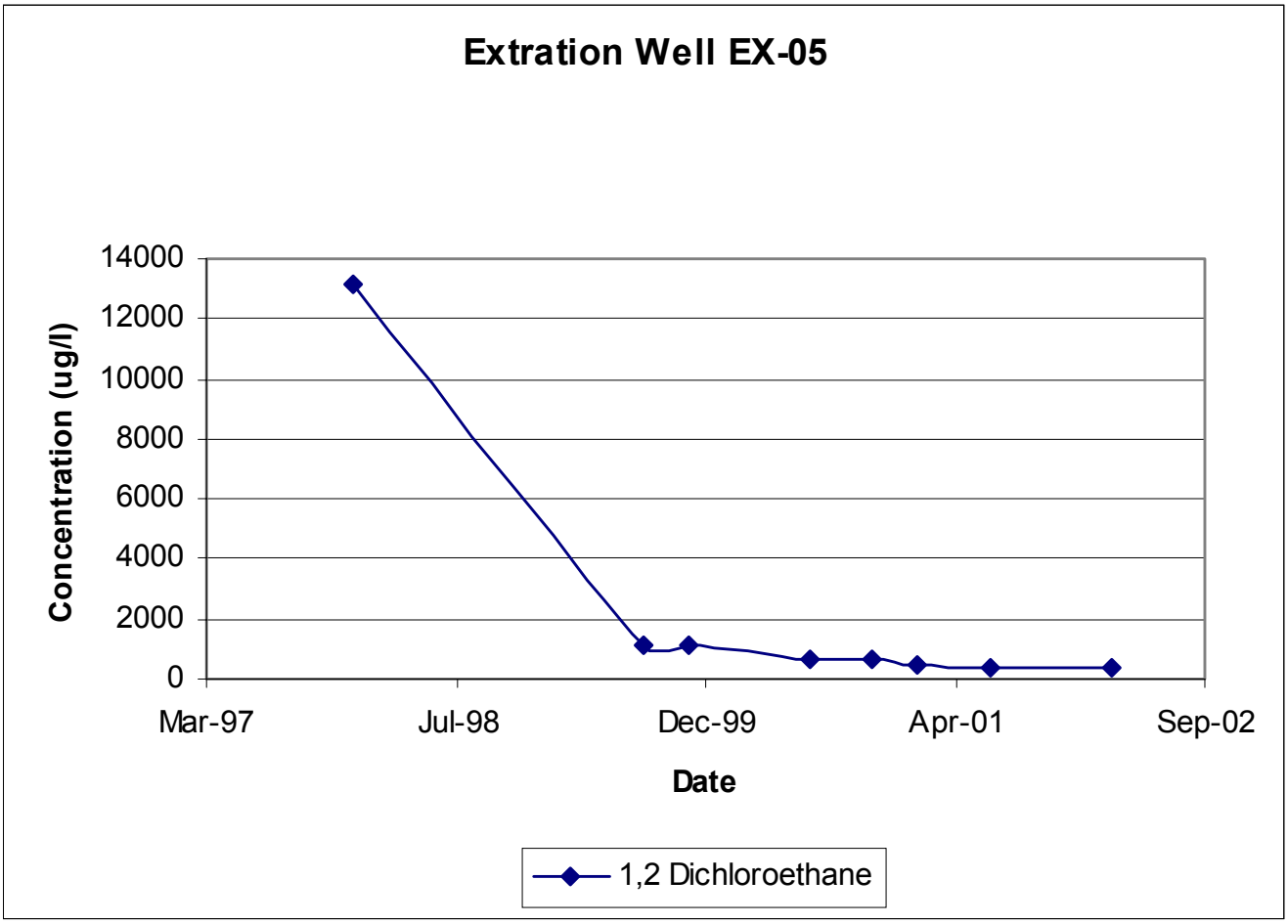


Figure F-4. Concentration of 1,2 Dichloromethane at Well EX-05.

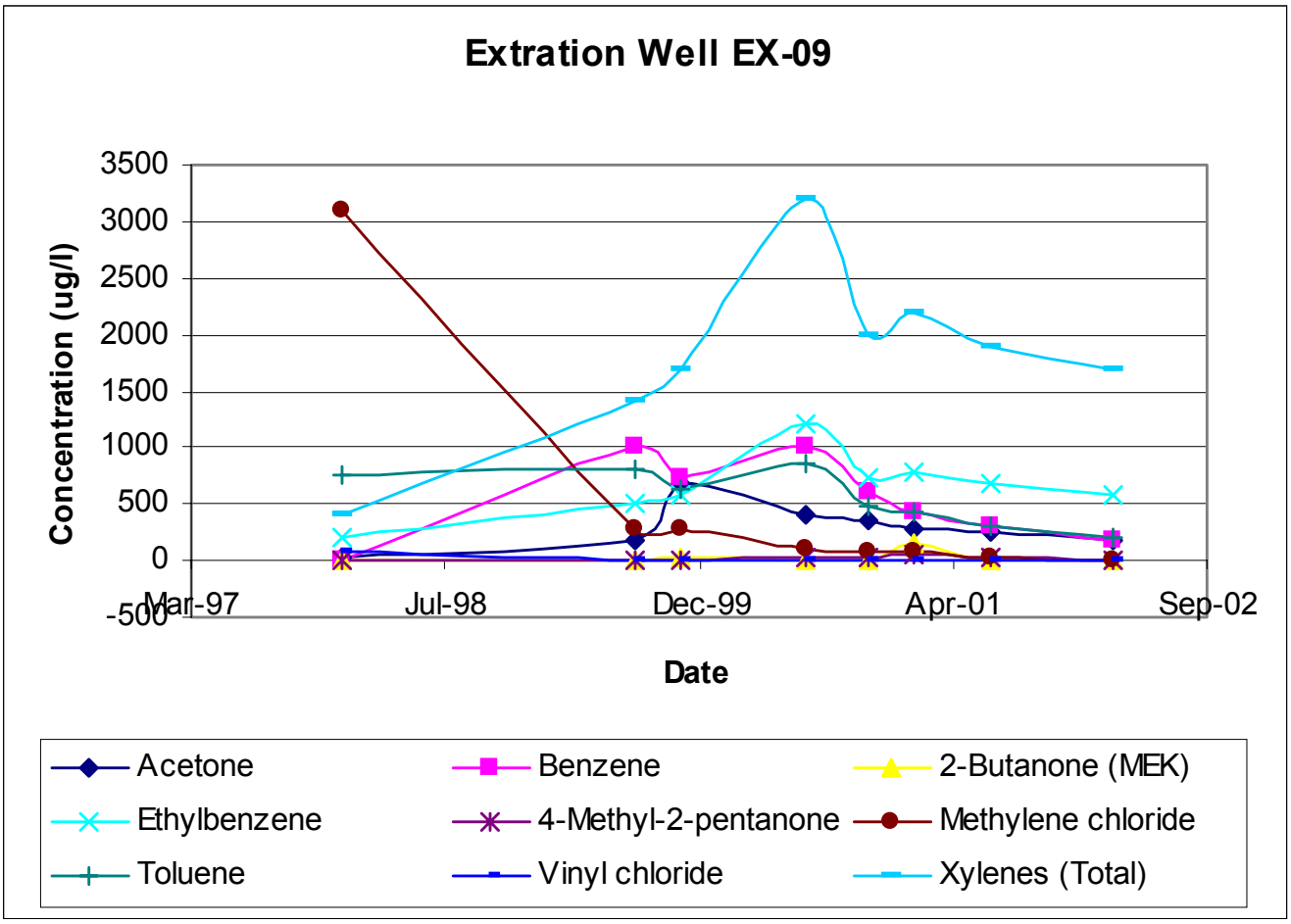


Figure F-5. Organic Chemical Concentrations at Well EX-09.

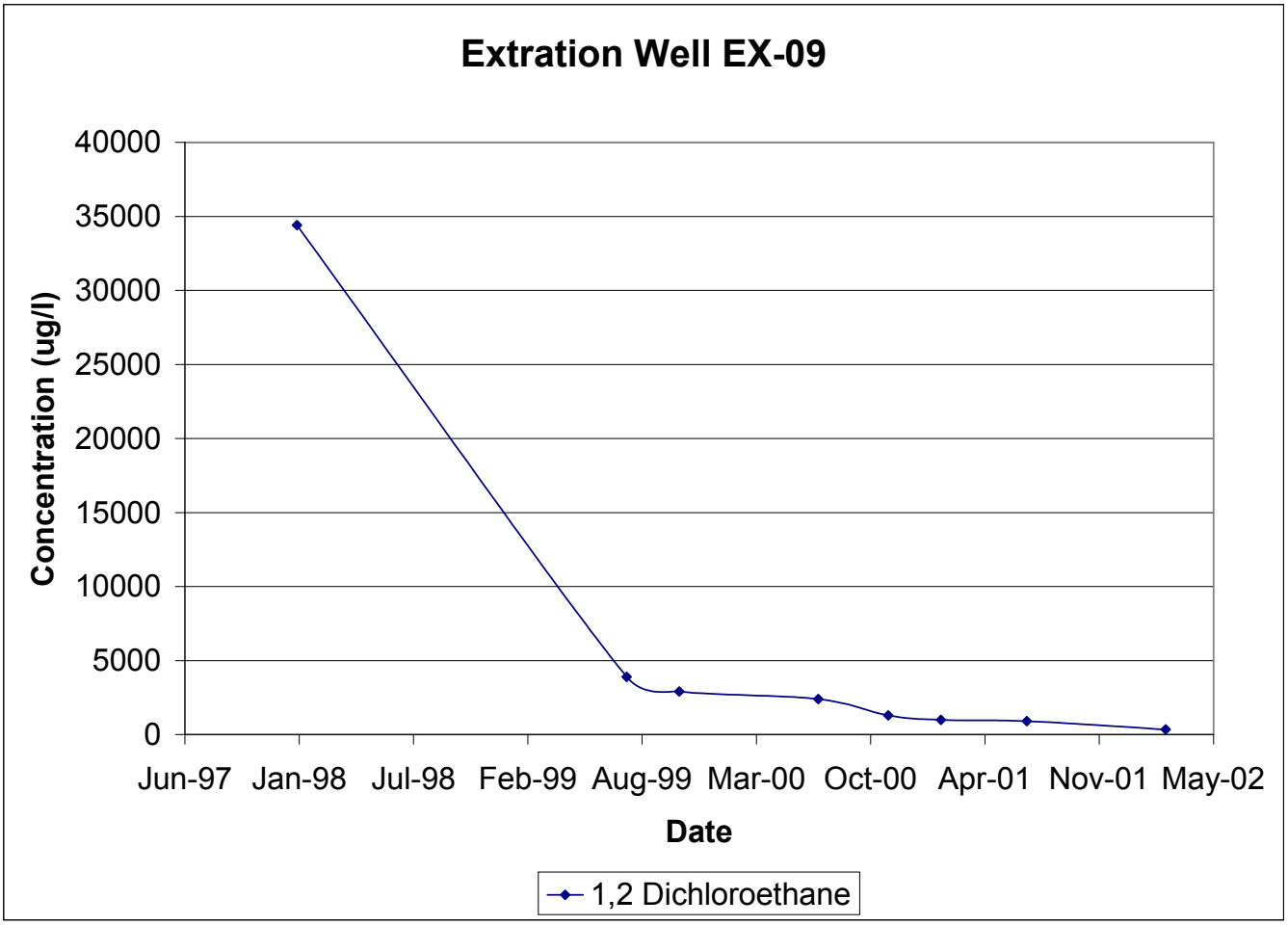


Figure F-6. Concentration of 1,2 Dichloromethane at Well EX-09.

Attachment G

Groundwater Contour Maps

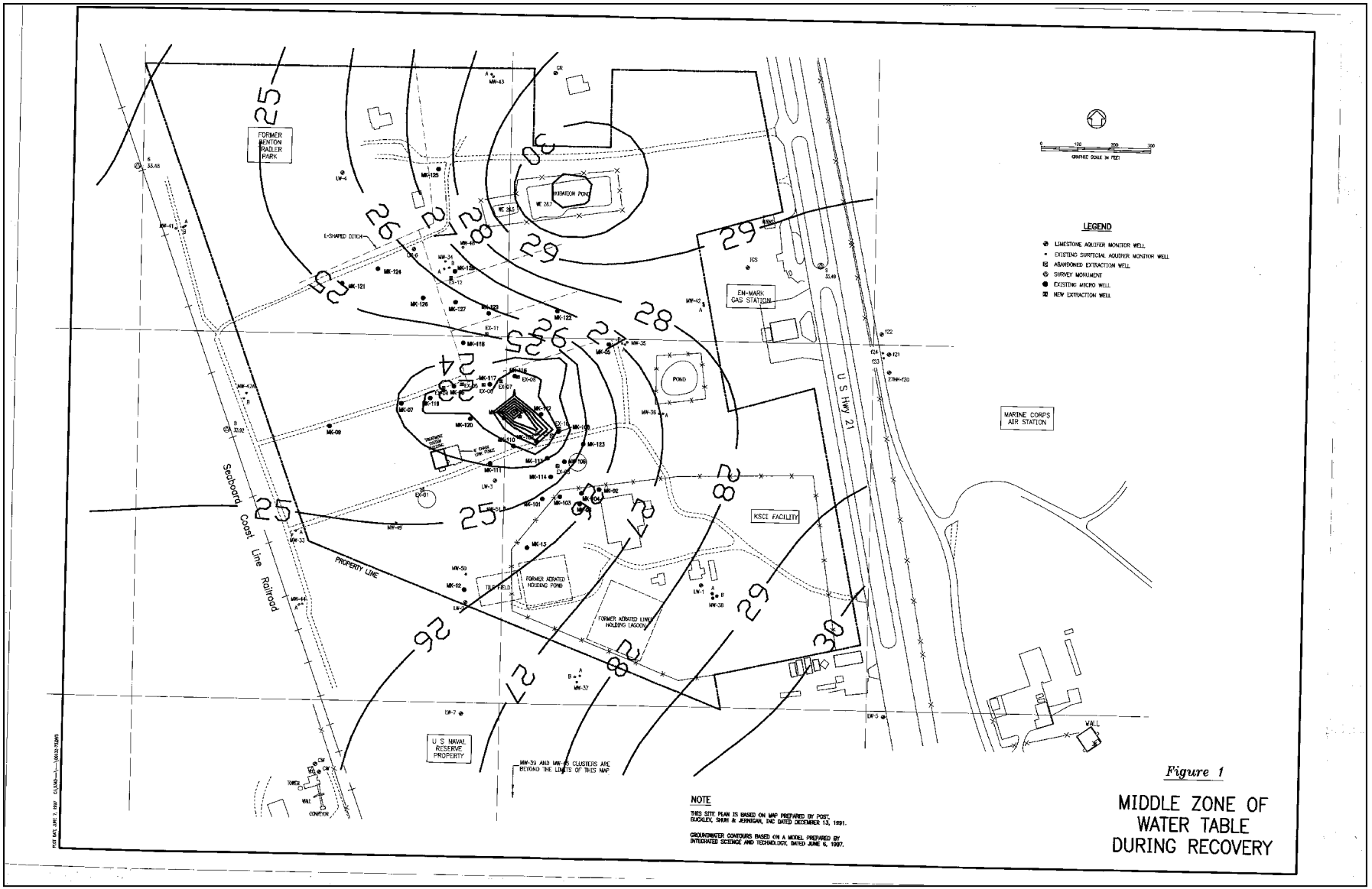


Figure G-1. Groundwater Contour Data for Confined Zone.

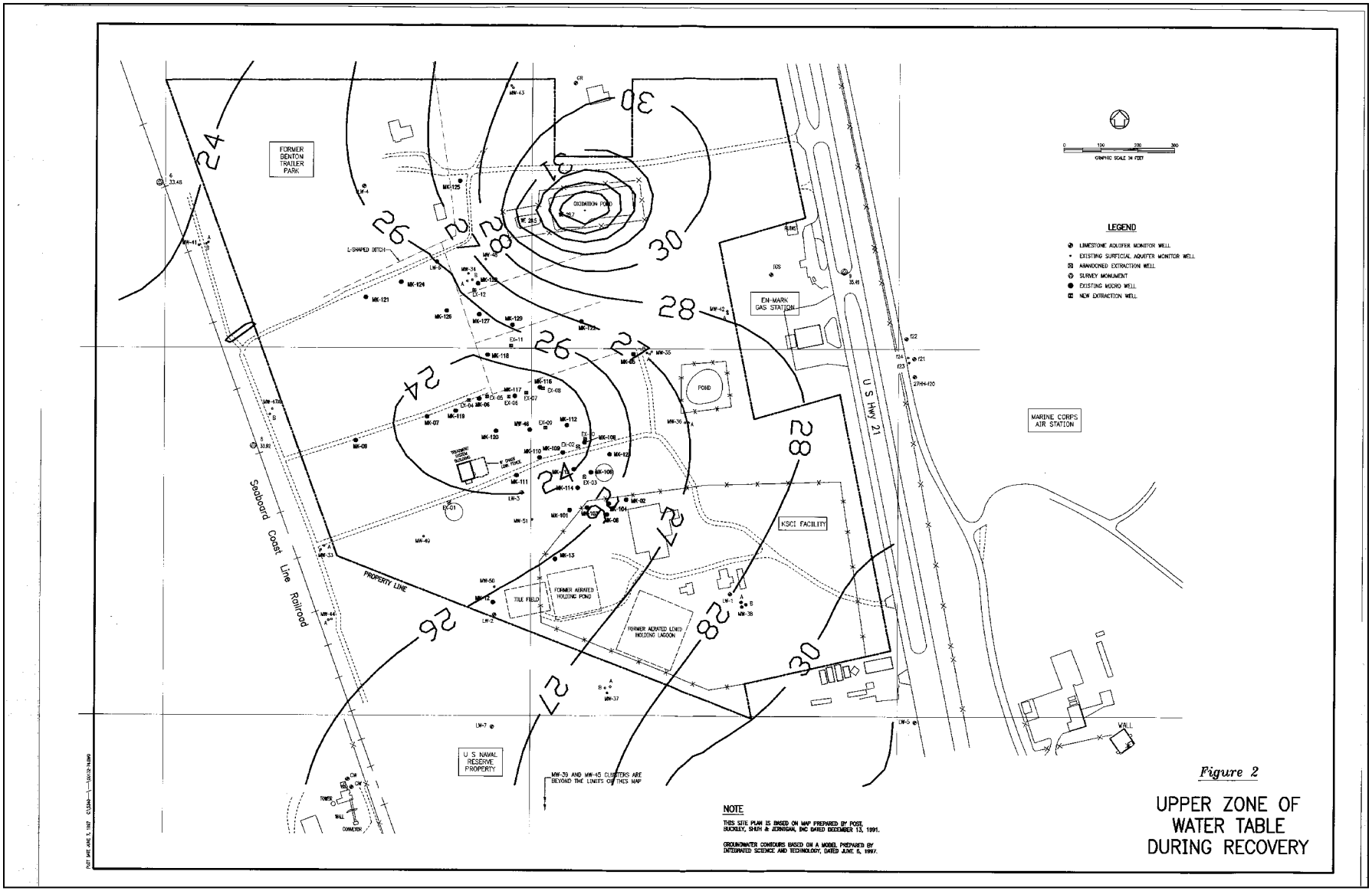


Figure G-2. Groundwater Contour Map of Surface Zone.